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SEMI-MONTHLY PROGRESS LETTER MPL-1/191

DESIGN AND IMPLEMENTATION OF PHYSIOLOGIC
MONITORING SYSTEMS

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Submitted by:

L. B. Lambert
Laboratory Supervisor

Approved by:

J. H. O'Neill
For J. H. O'Neill
Director

632 West 125th Street
New York 27, New York

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I. OBJECTIVES

This project is to develop for the Ames Research Center of the National Aeronautics and Space Administration the required instrumentation for the monitoring of experimental animals' physiological behavior in the experimental balloon flights to observe the effects of cosmic radiation on experimental animals. Each flight is to contain two monkeys plus a number of other animals and living organisms complete with life support systems, data recording equipment and various physiological monitoring devices, including bloodflow meters developed at Columbia University's Electronics Research Laboratories (CUERL).

Each balloon flight consists of five 36-inch spheres of which three will contain animals or biological instrumentation. These will be equipped and outfitted by CUERL. However, such components as the tape recorders, the life support system and the film packs are to be supplied by others, and are to be installed at the field test site. The spheres will comprise a capsule which contains the animals, film packs, life support equipment, transducers and preamplifiers; a second sphere holding the batteries for the blood flowmeter, data processor, a capsule temperature probe and a pressure failure switch; and a third capsule carrying the flight recorder and batteries, the batteries for the instrumentation, the power supply regulator, thermistor bridges, commutators, a temperature probe and a pressure failure switch. These Laboratories will design and implement blood flowmeters for monkeys together with portable preamplifiers, so that this data may be recorded during the flight.

The equipment plan for the flights calls for an absolute pressure transducer to sense the monkey capsule ambient pressure, a capsule temperature and two body temperature sensors (thermistors). A blood flowmeter will be supplied for one

of the two animals. One electromyograph (EMG) plus an integrator will be supplied for each animal to obtain respiration rate information through electrodes implanted in the diaphragm. Four electroencephalograph (EEG) amplifiers and an electrocardiograph (EKG) channel for each animal completes the initial physiological flight instrumentation. These Laboratories are to supply scientific and technical supports for the test flights at the launching site Goose Air Force Base, Goose Bay, Labrador and are to assist in the evaluation and interpretation of the test flight data.

II. PROGRESS

The final design for the flight model of the blood flowmeter has been determined and a working model has been tested successfully.

A number of amplifiers is required for each flight to service the various animal instrumentation channels as well as the life support system. Out of several types of amplifiers evaluated, the Telemedics amplifier was found to be acceptable and the required number of units has been received. One amplifier has been modified for the use with the blood flowmeter and is being utilized to test the 40 probes that are under construction.

An EMG integration technique has been successfully tested; therefore, the respiration rate signals can be recorded and can be considered as reliable data.

Capsule wiring has been designed and all necessary connectors have been received. Two sets of capsules are being wired at the present time.

III. WORK TO BE ACCOMPLISHED DURING NEXT REPORT PERIOD

The completion of the wiring of the initial two sets of capsules should be completed.